UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/092,777	03/08/2002	Tsuyoshi Kaneko	112181	2525

25944 7590 03/01/2004

OLIFF & BERRIDGE, PLC
P.O. BOX 19928
ALEXANDRIA, VA 22320

EXAMINER	
VOCKRODT, JEFF B	
ART UNIT	**PAPER NUMBER**
2822	

DATE MAILED: 03/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/092,777	KANEKO ET AL.	
	Examiner	Art Unit	
	Jeff Vockrodt	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 November 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26 and 28-31* is/are pending in the application.

4a) Of the above claim(s) *17-26* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16 and 28-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to amendment filed on November 24, 2003. Claims 1-26, 28-31 are pending. Claims 17-26 are withdrawn from consideration under 37 CFR 1.142(b).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-9 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. 5,513,199 ("Haase") in view of U.S. 5,658,823 ("Yang").

Claim 1 corresponds to Haase as follows: A method of fabricating a surface-emission type light-emitting device including a column-shaped section formed on a substrate which functions as at least a part of a light-emitting device, which emits light in a direction perpendicular to the substrate,[1] comprising the following steps (a) to (e):

(a) a step of forming a multilayer film (28', 24', 20', 14', 18', 16', 22', 35, 26', 30) including an active layer (18') on the substrate (12'), and etching at least a part of the multilayer film so as to form the column-shaped section (35, 26', 30),

(b) a step of forming a first resin layer (polyimide 34') so as to cover the column-shaped section (the polyimide is deposited over the electrode 30; col. 8, ll. 38-40),

---

[1] To the extent that the preamble's non-manipulative statements "surface-emission type" and "emits light in a direction perpendicular to the substrate" might differ from Haase (a edge-emitting laser), the method claim is not limited by non-manipulative statements in the preamble that serve only to point out a particular application of the method. Additionally, these limitations are only present in the body of dependent claim 14 which further supports the conclusion that claim 1 is not limited by them.

(c) a step of forming a second resin layer by changing a solubility of an upper part of the first resin layer formed above an upper surface of the column-shaped section in a specific liquid (UV exposure step; col. 8, ll. 43-47),

(d) a step of immersing, for a specific period of time, at least the second resin layer in the specific liquid having characteristics which cause the second resin layer to dissolve, so as to remove the second resin layer at least in the area formed over the column-shaped section (developing step; col. 8, ll. 43-47), and

(e) a step of forming an insulating layer (34') which covers a side surface of the column-shaped section (35, 26', 30) by curing the second resin layer (curing step; col. 8, ll. 47-50).

The UV exposure step in Haase differs from step (c) as currently claimed since Haase does not expose the part of the resin above the upper surface of the column shaped section, but instead, exposes the portions outside of that region. Thus, the solubility of the upper region is never changed in Haase.

Yang teaches "a step of forming a second resin layer [108b] by changing a solubility of an upper part [108a] of the first resin layer [108] formed above an upper surface of the column-shaped section [104] in a specific liquid. Yang accomplishes a photoresist patterning step that exposes a column using a process that does not require any alignment of a mask, because the mask is omitted in favor of a flood exposure step.

Official notice is taken that it is well known in the semiconductor manufacturing art that eliminating a process step in the manufacture of a semiconductor device is desirable for at least the reason that the total cost (including time) of manufacturing a semiconductor device can be reduced by reducing the number of steps required to make it.

It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the photoresist patterning step for exposing the column-shaped projection of Haase

with the patterning process of Yang which does not use a mask. One of ordinary skill in the art would have been motivated to make this modification by the expectation of eliminating the alignment step necessary in the process of Haase.

Claim 2. The method of fabricating a surface-emission type light-emitting device as defined in claim 1, wherein the step (a) changes the solubility of the first resin layer in the specific liquid by applying one of heat and light to the first resin layer. (The polyimide layer is irradiated with UV light, which changes its solubility in the developer solution.)

Claims 3 and 8. Claim 3 differs from claim 1 by requiring "semi-curing" the first resin layer in step (c). Probimide 408 is a negative-type photosensitive polyimide. Thus, the exposure step involves a degree of crosslinking--i.e., semi-curing. Probimide is a negative-type photosensitive polyimide. See U.S. Pat. No. 5,229,257 ("Cronin").[2] Cronin teaches patterning Probimide 408. Cronin describes an organic solvent "gammabutyrolactore" and removing the unexposed regions (i.e., implying that the exposed regions withstand the developer--the defining characteristic of a negative resist).

Claims 4 and 5. See treatment of claim 1 and claim 2 above.

Claim 6. The method of fabricating a surface-emission type light-emitting device as defined in claim 1, wherein the liquid has characteristics which removes the second resin layer. (The developer removes the second resin layer.)

Claim 7. The method of fabricating a surface-emission type light-emitting device as defined in claim 1, wherein the column-shaped section has a lower solubility in the liquid than the second resin layer. (The column shape section has a lower solubility in the developer than the exposed polyimide as it is not removed by the developer.)

---

[2] Cronin is cited as evidence as to what Probomide 408 is and not to prove its existence in the prior art. The existence of Probimide 408, and all claim elements, is established by Haase, which is the sole basis for the rejection under §102.

Claim 9. The method of fabricating a surface-emission type light-emitting device as defined in claim 1, wherein the insulating layer is formed of a polyimide resin. (see above.)

Claim 13. The method of fabricating a surface-emission type light-emitting device as defined in claim 1, wherein the surface-emission type light-emitting device is any of a surface-emitting semiconductor laser, an LED device, and a semiconductor light amplification device. (Haase teaches a laser, which is a light amplification device.)

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Haase and Yang as applied to claims 1-9 and 13 above, further in view of U.S. 6,160,081 ("Tanaka").

Claim 10 differs from Haase by requiring an alkaline solution as a developer liquid. Alkaline solutions are used in conjunction with positive photosensitive compounds (i.e., compounds that increase in solubility upon exposure). Haase teaches, on the other hand, a photosensitive polyimide and does not state what kind of developer is used.

Tanaka teaches a photosensitive polyimide that uses an alkaline developer solution. Tanaka teaches that alkaline developer solutions are desirable relative to organic developers since they are low-cost, non-explosive, not harmful to human health (col. 2, ll. 5-8).

Tanaka and Haase are both related to photosensitive polyimide.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a photosensitive polyimide with an alkaline developer in the process of Haase. One of ordinary skill in the art would have been motivated to do this to avoid undesirable organic developers as taught by Tanaka.

Claims 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Haase, Yang, and Tanaka as applied to claim 10 above, further in view of U.S. 5,508,803 ("Hibbs").

Claims 11-12 differ from Haase and Tanaka by requiring forming a monitor section to monitor the removal of the second resin layer.

Hibbs teaches a monitor structure for providing data exposure, sensitivity, and processing conditions (col. 6, last ¶).

It would have been obvious to one of ordinary skill in the art at the time of the invention to include a monitor structure in the process taught by Haase and Tanaka. One of ordinary skill in the art would have been motivated to provide such structure in order to provide data about exposure, sensitivity, and processing conditions as taught by Hibbs.

Claims 14-16 and 28-31, 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Haase and Yang as applied to claims 1-9 and 13 above, further in view of U.S. 6,088,378 ("Furukawa").

Claims 14-16 differ from Haase by requiring a "surface-emitting semiconductor laser, wherein the column-shaped section comprises an active layer, and wherein the surface-emission type light-emitting device comprises a resonator formed of a semiconductor deposition including the column-shaped section at least in part." Haase teaches a side emitting structure in which the cladding ridge structure is buried in a polyimide coating.

Furukawa teaches a surface emitting layer having a polyimide burying layer, but does not teach the specific method of applying a polyimide burying layer as required in independent claim 1.

Furukawa and Haase are both related to lasers employing a polyimide blocking layer.

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the blocking layer using the process of Haase to the ridge structure of a vertical cavity surface emitting laser such as taught by Furukawa. One of ordinary skill in the art would have

been motivated to use the photosensitive polyimide process of Haase to eliminate the need for a reactive ion etching (RIE) step as required in the process taught by Furukawa.

Claims 28-33 differ from Haase by requiring a filler in the matrix (e.g. polyimide) layer. Furukawa teaches that adding a filler of AlN to the polyimide blocking layer increases the thermal conductivity of the blocking layer and improves dissipation of thermal energy.
It would have been obvious to one of ordinary skill in the art at the time of the invention to include AlN in the polyimide blocking layer of Haase. One of ordinary skill in the art would have been motivated to modify the reference in this manner to improve the thermal dissipation in the device as suggested by Furukawa.

Response to Arguments

Applicant's arguments with respect to claims 1-26, 28-31 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning communications from the examiner should be directed to Jeff Vockrodt at (571) 272-1848. The examiner can be reached on weekdays from 9:30 am to 5:00 pm EST. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian, can be reached at (703) 308-4905.

The fax number for official correspondence is 703-872-9306. Unofficial communications to the examiner may be faxed to 703-746-4073. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist at (703) 308-0956.

January 29, 2004
J. Vockrodt

AMIR ZARABIAN
SUPERVISORY PATENT EXAMINER